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ON THE TRUE STATUS OF THE GENUS *CACOPOIDES*.

BY THOMAS BARBOUR.

In August, 1907, a considerable collection of reptiles and amphibians was purchased from Mr. Alan Owston, of Yokohama, Japan. Most of the specimens were from the island of Formosa, from Hainan and from various localities in the Riu Kiu archipelago. A few specimens, however, were from the Chinese mainland, some from Sian, capital of the province of Shensi, while others were from Antung in Manchuria. Among the specimens from this last locality was a peculiar "digger toad" upon which I founded the genus *Cacopoides*. Dr. Stejneger, about the time of the description, rather doubted the probability of the specimen having come from Manchuria. I am assured, however, that the locality is correct by Mr. Owston, and from the specimens which were received with the toad there seems every reason to believe that it is authentic. Two typical Northern species of frogs, to wit, *Rana nigromaculata* and *Rana amurensis*, as well as a specimen of *Amyda schlegelii*, came in the same jar with *Cacopoides*. In October, 1908, the writer happened to be in London for a few days, en route to Brazil. The opportunity was taken to discuss the new genus with Dr. Boulenger at the British Museum. He had not at that time received a copy of the paper in which *Cacopoides* was described. From my verbal description it seemed very probable that the new genus was identical with Boulenger's *Kaloula verrucosa*. This species resembles the other closely in outward appearance and in coloration, and moreover had been reported recently by Wolterstorff from the neighborhood of Tsingtau in Shantung.

The finding of an amphibian of the family Engystomatidae as far north as the province of Shantung immediately makes it evident that there was no particular reason to doubt the accuracy of the locality of *Cacopoides borealis*, which I must confess I did at first.

Now, thanks to the kindness of Dr. Boulenger, I have two specimens of *Kaloula verrucosa* from authentic topotype material taken at Yunnan-fu, as well as a third specimen obtained by purchase and collected there also by Mr. John Graham, the discoverer of the species. So that it becomes possible to present a comparison of this species with the one from Manchuria.

Unfortunately, the case was somewhat complicated by a short note which I mailed from Europe and published in the *Proceedings of the Biological Society of Washington* (Vol. XXII, April 17, 1909, p. 89). This note read as follows:

"A correction is to be made in the case of *Cacopoides borealis* Barbour, described as the type of a new genus and species in a paper on 'Some New Reptiles and Amphibians' (*Bull. Mus. Comp. Zool.*, Vol. 50, No. 12, p. 321, April, 1908). It appears that this must now be considered identical with *Callula verrucosa* Boulenger, though considerably variant from the type of that species and vastly removed from it in range. Boulenger's specimen came from Yunnan, while that on which the supposed new species was based was collected at Antung, Manchuria."

Drawings have been prepared to show not only the difference in outward appearance between the two species but the shapes of the terminal phalanges, the sacral diapophyses, the sterna, and the interiors of the mouth cavities. In some cases drawings illustrate the form of the same structures in the allied genus *Cacopus*. A comparison of these figures will serve to show graphically and more satisfactorily the differences than would a lengthy verbal description.

For the sake of record the original description is appended herewith from the *Bulletin of the Museum of Comparative Zoology* (Vol. LI, No. 12, April, 1908, p. 321):

Cacopoides gen. nov.

An engystomatid related to *Cacopus*. The precoracoids are wanting, the coracoids meet each other on the median line, without an intercalated cartilage; the large metasternal cartilage, instead of being connected to the coracoids by an isthmus, much more narrow than the metasternum itself, is closely adpressed to the coracoidal symphysis. This may be made more clear by the appended drawings. Choanæ small, with valve-like flaps; dermal ridges behind the choanæ converging posteriorly and each with an enlarged papilla near the median line; another long ridge in front of the œsophagus which is sharply curved anteriorly near the median line. Tympanum hidden. Fingers free, toes webbed at base, tips not dilated. Sacral diapophyses rather strongly dilated.

Cacopoides borealis sp. nov.

Habit very stout. Head small; snout rounded; no canthus rostralis; snout about as long as orbital diameter; interorbital space more than twice the diameter of the upper eyelid. Fingers moderate, first shorter

than second; toes moderate, webbed at base; no subarticular tubercles; two metatarsal tubercles, the inner strong and shovel-like, the outer weak. Hind limb short. Skin smooth, the dorsal surface with scattered minute pits. Color dark brown-olive above; beneath dusky, marbled with brown. A subgular vocal sac is present.

A re-examination of the type has not rendered it necessary to make any very radical change in the diagnosis as it was originally published. A careful examination shows, however, that there is a very small bit of intercalated cartilage at the symphysis of the coracoids.

There remains, however, a considerable number of differences from *Kaloula*, which seem well worth pointing out. In the first place, the presence of valves in the choanæ serves to distinguish the interior of the mouth at once from that in *Kaloula* and suggests a possible relationship with *Cacopus*. In this genus, however, though valves are present in the internal nares, nevertheless the great size of the openings and the characteristic reduction of the palatal projections to two small bony points serve to distinguish this Indian genus at once from ours. The diagrams of the three sterna show that in shape the sternum of *Cacopoides* is more or less intermediate in form between those of the other two genera. As regards the shape of the terminal phalanges it will be seen that here again the form is intermediate between those of *K. verrucosa* and *Cacopus globulosus*. For the sake of comparison, drawings have been made to show the phalanges in *Kaloula pulchra* and *K. baleata*. These call attention to the extreme variation which may take place in the shape of these bones within a single genus. In the first specimen which Boulenger received, and in many of the subsequent specimens, the verrucose condition of the skin of the dorsum led to his giving the name he did to the Yunnan species. In the type of *Cacopoides*, however, the skin presents a finely pitted appearance, in sharp distinction to the common condition in the species previously mentioned. The reduction of size of the hind limb, the relatively large size of the mouth opening, the difference in coloring which is readily seen from a glance at the drawings, as well as the shape and size of the sacrum and urostyle, serve at once to show the complete distinction of the new genus. The type of *Cacopoides borealis* in actual size is somewhat larger than the largest of the three specimens of *Kaloula verrucosa*. Yet the urostyle is shorter and the sacrum narrower and rather more dilated than in the other species.

The discovery of this toad in Manchuria is as remarkable as unexpected when we think of the distribution of the Engystomatidæ in eastern Asia. The probability that, owing to the habits of these

creatures they may exist in a locality comparatively well explored zoologically without their presence being suspected until they are found by the merest accident, renders it quite impossible to draw any conclusions regarding the exact relationships and dispersal of these forms.

For the sake of comparison, descriptions of the genera *Cacopus* and *Kaloula* are added hereto, as well as Boulenger's original description of *Kaloula verrucosa* :—

Cacopus Gthr.

Pupil erect. Tongue oval, entire and free behind. Choanæ very large, with a dermal movable flap, which can close the nostril; two small bony prominences close together, between and on a level with the hinder edge of the choanæ; a small papilla on the hind margin of each choana; a narrow denticulated dermal ridge across the sphenoidal region; another, very broad, in the front of the oesophagus. Tympanum hidden or very indistinct. Fingers free; toes webbed at the base, the tips not dilated. Outer metatarsals united. Precoracoids none; sternum a large cartilaginous plate. Diapophyses of sacral vertebra rather strongly dilated. Terminal phalanges simple.

India. (Boulenger, *Cat. Batr. Sal.*, 1882, p. 174.)

Kaloula Gray.

Pupil erect. Tongue oblong, entire and free behind. Vomerine teeth none. Palatine bone forming an acute, sometimes toothed ridge across the palate. Two cutaneous, more or less distinctly denticulated ridges across the palate, in front of the oesophagus. Tympanum hidden. Fingers free, toes more or less webbed (exceptionally free), the tips more or less dilated. Outer metatarsals united. No precoracoids; no omosternum; sternum cartilaginous. Diapophyses of sacral vertebra moderately dilated. Terminal phalanges triangular or T-shaped.

East Indies. (Boulenger, *l. c.*, p. 167.)

Kaloula verrucosa Blgr.

Snout rounded, not prominent, as long as the eye; interorbital space as broad as the upper eyelid. Fingers slender, with slightly swollen tips, first a little shorter than second; toes moderate, nearly half-webbed, the tips blunt, not swollen, fifth considerably shorter than third; subarticular tubercles well developed; metatarsal tubercles two, oval, compressed, the inner very large. The tibiotarsal articulation reaches the shoulder or between the shoulder and the eye. Upper parts with large smooth warts; a fold from the eye to the shoulder. Dark grayish brown above, uniform or with six longitudinal rows of small darker spots; lower parts uniform dirty white.

Kaloula, spelt thus, dates from Gray's *Zoological Miscellany*, 1831 p. 38. *Callula*, a more recent emendation, has no standing in nomenclature.

EXPLANATION OF PLATES XVII AND XVIII.

PLATE XVII.—Fig. 1.—Mouth of *Kaloula verrucosa*. × 2.

Fig. 2.—Mouth of *Cacopoides borealis*. × 2.

Fig. 3.—Mouth of *Cacopus globulosus*. × 2.

Fig. 4.—*Kaloula verrucosa* (Blgr.). Natural size.

Fig. 5.—Type of *Cacopoides borealis* Barbour. Natural size.

PLATE XVIII.—Fig. 1.—Sternum of *Cacopus* after Boulenger.

Fig. 2.—Sternum of *Cacopoides*. × 2.

Fig. 3.—Sternum of *Kaloula verrucosa*. 2.

Fig. 4.—Sacrum and urostyle of *Cacopoides*. × 2.

Fig. 5.—Sacrum and urostyle of *Kaloula verrucosa*. × 2.

Fig. 6.—Terminal phalanx, *Kaloula baleata*.

Fig. 7.—Terminal phalanx, *Kaloula pulchra*.

Fig. 8.—Terminal phalanx, *Kaloula verrucosa*.

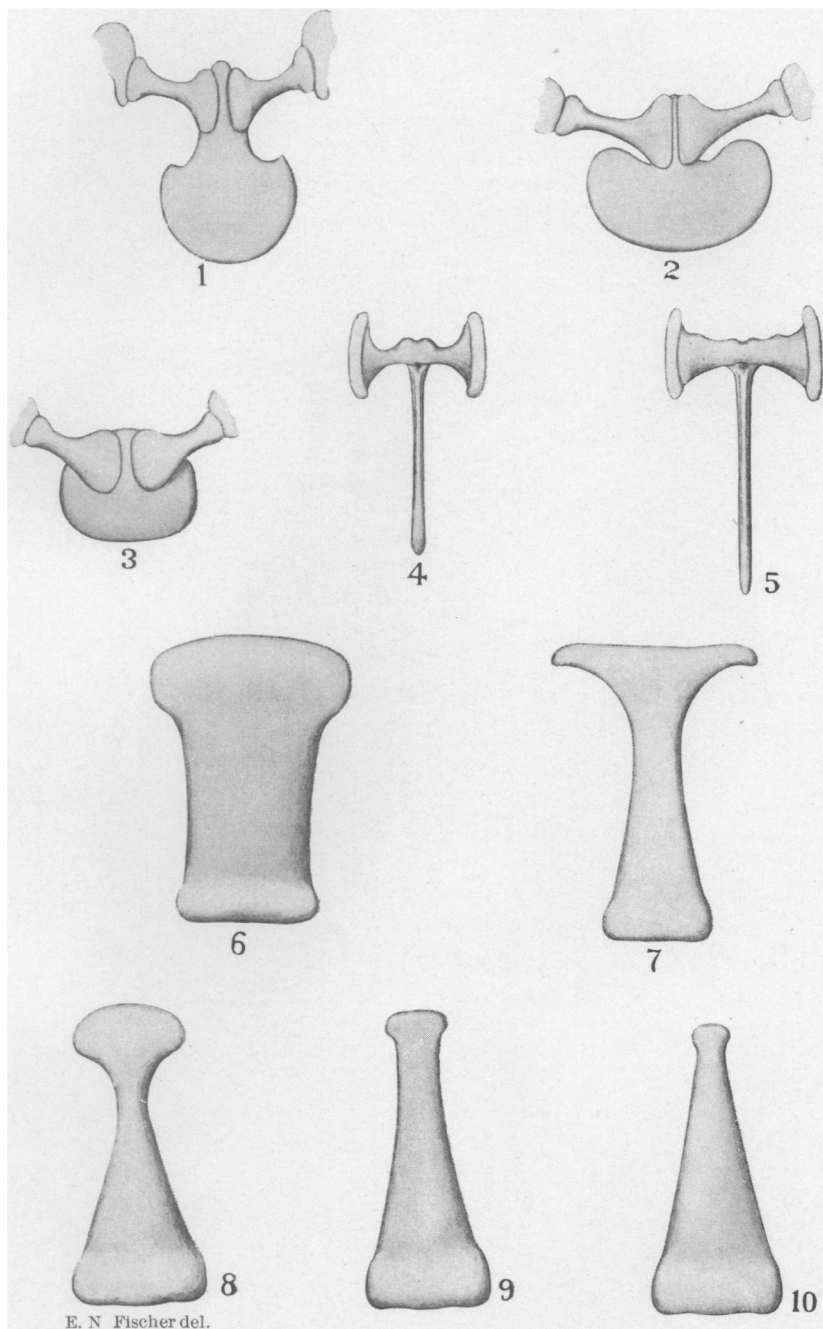
Fig. 9.—Terminal phalanx, *Cacopoides borealis*.

Fig. 10.—Terminal phalanx, *Cacopus globulosus*.



E N. Fischer del.

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